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(71) Applicant *(for all designated States except US)*: GENERAL INSTRUMENT CORPORATION [US/US]; 101 Tournament Drive, Horsham, PA 19044 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: CHENOWETH, John, Stephen [US/US]; 1405 Angelina Bend Drive, Denton, TX 76205 (US). MARTIN, Thomas, Forde [US/US]; 1629 Villanova Drive, Richardson, TX 75081 (US). NELSON, Douglas, Neil [US/US]; 18749 Marsh Lane #1712, Dallas, TX 75287 (US). TINGUELY, Paul, Richard [US/US]; 2720 Meadow Creek, Bedford, TX 76021 (US).

(74) Agent: LIPSITZ, Barry, R.; Building No. 8, 755 Main Street, Monroe, CT 06468 (US).

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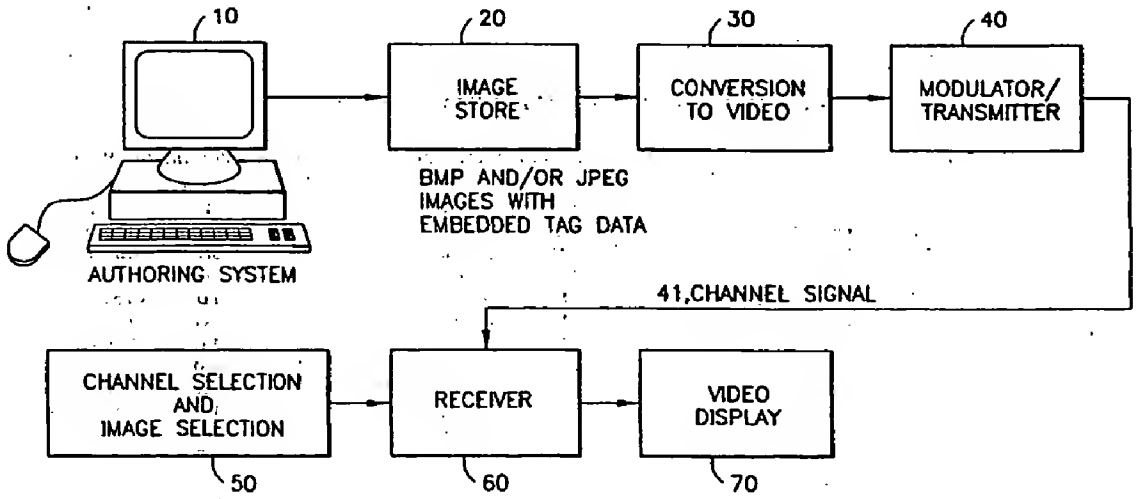

(57) Abstract

A still image to be provided to a television viewer is sent in a portion (such as a field or frame) of an analog television signal (41). A receiver (60), such as a set-top converter or equivalent device, receives and stores the portion containing the still image. The portion is then processed for display on the viewer's television or other video appliance (70), rather than generating the image using an on screen display controller. In one embodiment, an image (332) carried in a field of an analog television signal is grabbed as it comes by from a repeated series of images (400). This image (332) is then processed to provide a viewer requested display. Data tags (80) innocuously embedded in the image itself are used to facilitate the retrieval of desired images.

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VIRTUAL CHANNEL MECHANISM FOR TELEVISION SYSTEM

This application claims the benefit of U.S. provisional application no. 60/132,528 filed on May 5, 1999.

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for supplying information to television system users on an interactive request basis in the form of video still images, without communication from the user back to the system's central server. More particularly, the invention relates to any application where a user seeks information that can be presented in a television image.

The invention was initially developed for use in a pay-television (also known as "subscription television") addressable set-top converter. Such converters are well known for use with wireless pay-television systems, whether multi-point microwave distribution systems (MMDS) or conventional VHF/UHF television systems, as well as satellite and cable television systems. However, the invention is equally applicable to information kiosks, advanced televisions, and other information sources that provide information over a video display. Within such applications, the invention is well suited to provide electronic program guide (EPG) capability, advertising information, entertainment services, and the like.

In the past, conventional teletext has been developed to present information on a television screen as requested by a user. In such systems, the requested information is retrieved from a data stream that is repeatedly transmitted. Such teletext information is transmitted as digital data, retrieved by a receiver, and then decoded and displayed via an on-screen display (OSD) controller. One major drawback of such prior art systems is that the images are constrained by the graphics capability (or lack thereof) of the OSD controller.

In another system, developed by CableShare in Canada, an analog television signal is grabbed and stored for display on the user's TV set. However, the CableShare system transmits the image as a complete frame on demand and is therefore slower and less efficient than desired. More importantly, the CableShare system is based on the central concept of sending an image on request, and thus relies on a data return path. In particular, a telephone return path is necessary.

It would be advantageous to provide a video system for providing information that overcomes the shortcomings of the prior art. More particularly, it would be advantageous to provide a system for communicating textual information in which greater content freedom is possible than with prior art teletext implementations and wherein the images provided to a user are not constrained by the graphics capability of an OSD controller.

It would be further advantageous to provide an efficient system for grabbing an analog television signal and providing textual information therefrom for display on a television screen, without having to store and process a whole frame at a time, and without the need for a return path from the user back to the television system operator.

The present invention provides a method and apparatus having the aforementioned and other advantages.

SUMMARY OF THE INVENTION

In accordance with the present invention, an image to be provided to a user is not sent as digital data, but rather as one field of an analog television signal. The television signal may be sent by a conventional cable television system or a wireless television system. A receiving device, such as a set-top converter or equivalent device, repeatedly receives the image at a designated interval. At the request of a user the image is extracted from the television signal, which image is then stored and displayed on the user's television or other video appliance, rather than generating the image using an OSD controller. The images are selected for display without communication from the user back a television system operator.

In a particularly advantageous embodiment, the method and apparatus of the invention extracts a field of an analog television signal as it comes by from a repeated series of images. This field is processed to provide a requested display on the television screen or other video display.

The images may be sent within one television field (odd or even) or one television frame. Each virtual channel may comprise a sequence of images sent within one television field or frame. A single physical television channel may contain multiple virtual channels. Images within a virtual channel may be identified by image numbers.

In a preferred embodiment, each image is tagged with identifying data to provide an image navigation system. The data tags may be embedded or encoded in the first line of active video of each image or on the Vertical Blanking Interval (VBI) of each image such that the data is not easily perceptible to a viewer. Such data tags may include information relating to the virtual channel number assigned to the image, the image number assigned to the image, and a next image number which indicates the next successive image to be displayed.

In a preferred system, the first image displayed on selecting a virtual channel will be an opening menu channel which provides categories of images for a user to select from. A user will select a category number to view images in that category. Alternatively, the opening image may be the first image in a series of related images. For example, such an opening image may be the first page of an electronic programming guide having multiple pages.

Additionally, a virtual channel can be configured with the capability to provide sequential image display, animation, or a slide show display. In such a configuration, successive but different images are sent with identical image numbers, which are displayed on receipt by the receiver, each image replacing the preceding image automatically. The effect of sending and displaying successive images will vary from a slide show like presentation with fixed intervals to a

motion-JPEG, depending on how often the like number images are sent and the content of the images.

A user can select the desired virtual channel through a channel selector native to the users' television or other video appliance, including a remote control device. Virtual channels selected by a user are mapped to physical channels using a channel map provided in the receiver. The user tunes to a virtual channel just like any other channel, e.g., by pressing various function buttons provided on the receiver or remote control, such as FAV (favorite), CH UP (channel up), CH DN (channel down), by timer event, or by directly entering the channel number (one or more digits) via the user remote control.

Once tuned to a virtual channel, as user can navigate within the virtual channel using the following functions (or their equivalents): HOME, IMAGE, PREVIOUS, and NEXT. A "HOME" function causes the virtual channel's opening image to be captured and displayed. An "IMAGE" function causes the receiver to recognize numeric inputs as image numbers. A "NEXT" function causes the next image in a series of images to be captured and displayed. A "PREVIOUS" function allows previously viewed images to be captured and displayed. As each successive image is retrieved, its image number is stored in a cache. The image itself is not stored. Using the "PREVIOUS" function retrieves the preceding image number and thereafter the image identified by that image number is captured and displayed. Pressing "PREVIOUS" n times will cause the nth previous image to be displayed.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a block diagram representation of the invention;

Figure 2 shows a block diagram representation of the receiver;

Figure 3 shows multiple virtual channels carried in the same half field of a physical television channel;

Figure 4 shows multiple virtual channels carried in one field of a television channel and a video service carried in the other field of the same television channel;

Figure 5 shows an example menu and submenu usage within a virtual channel;

Figure 6 shows an image extracted from a series of images in a virtual channel;

Figure 7 shows a representative view of data used for navigation of a virtual channel embedded in the virtual channel images; and

Figure 8 shows a series of images with corresponding images in two representative virtual channels.

DETAILED DESCRIPTION OF THE INVENTION

The initial problem to be solved by the present invention springs from the wireless pay-television industry. Wireless pay-television systems, whether MMDS or conventional VHF/UHF television, are generally constrained to far fewer channels than the conventional cable TV systems that they often compete with. The problem is how such systems can offer more channels to their subscribers within the spectrum constraints imposed by government regulations. It is noted that just because the present invention was developed for the wireless pay-television industry, its use in a conventional cable system or other application is not precluded.

The virtual channel capability of the present invention allows the system operator to offer what appear to be multiple separate, interactive channels within the bandwidth of a single television channel. While there may be several means to implement a virtual channel, one need was to implement a system that would add little or no additional cost to the receiver.

Another constraint is the lack of a no-cost data return path in the typical wireless pay-television system. Either radio frequency (RF) return (assuming regulatory and technical hurdles could be cleared) or telephone return requires additional expense in the receiving device as well as logistics (e.g., connection to the telephone network).

In addition, the present invention overcomes the graphic capability shortcomings of the prior art systems. The present invention provides a system for providing full-color, high resolution and photo quality images, text of virtually any font, color, size or style, and graphics in any form, or any combination of such image, text or graphics, to a user through a virtual channel.

The present invention provides the following unique features:

1. Multiple virtual channels are provided within one single physical channel. User selection of the desired virtual channel is provided by selecting a channel number using the channel selection means native to the receiving device (e.g., direct channel number entry, FAVorite channel selection, Channel Up, or Channel Down) rather than pressing a special button (although a special button could be provided for this function). Provision is made to prevent the user from accessing images belonging to a virtual channel other than the selected virtual channel, even though such other images are present on the tuned physical channel. An additional benefit to this provision is that different authors can develop different virtual channels without having to coordinate image numbers among themselves.

2. An image navigation system is provided, based on data embedded in the image. This data specifies the image number, the next image number, and the virtual channel number, along with some error detection and control data. User control functions such as a Next, Previous, Image, and Home function are provided as well as the standard channel selection means in the receiver. This allows the author of the images on a virtual channel to completely and flexibly control the navigation through the images.

3. Each image is tagged on a line of the active picture part of the field instead of in the Vertical Blanking Interval (VBI). This facilitates the implementation of an authoring system. (Note, however, that the invention could be implemented using VBI data.)

4. The image tagging control mechanism allows for sequential image display capabilities and animation display capabilities.

5. The image is sent as a TV field instead of as a frame. (Although the invention could be realized using frame freeze instead of field freeze, with a reduction in bandwidth efficiency of 50% and corresponding doubling of the memory required in the receiver.)

A specific implementation of the invention will now be described in detail. It is noted that other implementations of the invention are also possible. All references to half channels in the following discussion are due to the fact that the described Virtual Channel mechanism was first conceived in connection with the development of a system that intended to provide two video services per channel instead of one, thus allowing a television system operator to double the number of such services offered to the system's subscribers. In the context of the inventive virtual channel concept, however, the doubling of channels is an implementation detail and is irrelevant to the general case, where e.g., three, four, five or more video services could be provided per channel.

A virtual channel (VC) is comprised of a sequence or series of still video images, which are sent in succession in one (even or odd) or both fields of a channel signal. Figure 1 shows a block diagram representation of the system. An authoring system 10, such as a personal computer, or the like may be used to create a virtual channel. An author arranges a series of images such as bitmap (.bmp) or JPEG (.jpg) images. Each image is provided with certain identifying data, such as an assigned virtual channel number, an image number, and a next image number. Data tagging will be discussed in more detail in connection with further embodiments of the invention. Each image created by an author is stored (Box 20) and subsequently

converted to a video still image (Box 30). A sequence of video still images are modulated and transmitted in a conventional manner (Box 40). The channel signal 41 comprising a sequence of images is sent from the transmitter 40 to a receiver 60 which is part of (or coupled to) a user's television or video appliance. A user is able to input channel selection and image selection information to the receiver 60 by using an input device 50, such as a remote control, native to the user's television. The selected image is displayed on the video display 70 of the user's television or video appliance, without communication from the user back to the television system operator. When the end of the sequence is reached, the system loops back to the beginning and starts over again.

The receiver, as represented by the block diagram shown in Figure 2, may be for example a set-top converter or equivalent device. A tuner 61 provided in the receiver 60 receives the channel signal 41. A channel may be selected by a user through controller 50. The signal provided by the selected channel is demodulated (Box 62) and the resulting analog video signal is then converted to a digital signal by an analogue/digital converter 63. The resulting digital signal is then read by a data tag reader 64 which determines the identifying data of each image in the series of images. The identifying data of each image is compared (Box 66) with an image number stored in an image number register 67. When a user selects an image number through the controller 50, the image number

register 67 stores the requested image number and the stored image number is compared with each image in the sequence of images until an identical image number is located (Box 66). When an identical image number is located, a signal is sent to a video memory 65 such that the video memory extracts and stores the requested image from the sequence of images. A signal is also sent to the controller 50 to indicate the image was located. The image may then be passed through an optional interpolator 68 (e.g., implemented in a digital signal processor), which may be turned on or off by controller 50 to modify the image quality. The image is then converted back to an analog signal by a digital to analog converter 69 for display on the video display 70.

The receiver 60 provides a controller 50 for a user to specify which image to store as the image is received. The controller 50 contains local function keys, 55, 56, 57, and 58 for virtual channel selection and image selection, as well as a receiving mechanism for receiving a signal (e.g., I/R) from a remote control. The function keys 55, 56, 57, and 58, and the remote control will be discussed in detail in connection with further embodiments. The receiver may be a stand alone set-top converter device, or contained within a VCR, a television, or other video appliance.

Once stored, the image is displayed on the television set or other video appliance until some other image is captured and displayed (usually upon

user command) or the channel is changed. The captured image is converted to a frame via digital signal processing, just as is any other channel doubled field. If the images are sent as frames, this step is not required, but the amount of memory required in the receiver will be doubled.

Multiple VCs can be contained in the fields available in the half or full channel. For example, Figure 3 shows a single physical television channel 1 having an odd field 3 and an even field 5. A signal 100 containing several virtual channels 101, 102, and 103 is sent in the odd field 3 of channel 1. A signal 200 containing multiple virtual channels 201, 202, and 203 is sent in the even field 5 of channel 1. In the example shown in Figure 3, the virtual channels carried in the odd field 3 comprise a Real Estate channel (vc21) 101, a Dining Guide (vc22) 102, and a Program Guide (vc23) 103. The virtual channels carried in the even field 5 comprise a Community Service channel (vc24) 201, Subscriber Ads (vc25) 202, and Auto Mall (vc26) 203. The signals 100 and 200 can be sent at varying rates which will determine the time for image retrieval. Image retrieval will be discussed further in connection with additional embodiments of the invention.

If a half channel is used, note that the other succession of fields not used for the VC (e.g., the even fields, if the VC is carried in the odd fields) can be used for a doubled motion video channel. Figure 4 shows a system where multiple virtual channels 101,

102, and 103 are carried only on the odd field 3 of the physical channel 1. The other half channel, the even field 5, is used to provide a video service 200.

Continuing with the example shown in Figure 3, if a user chooses to tune to the Real Estate channel 101, the user will enter virtual channel number 21 using a channel selection means native to the receiver or television. As shown in Figure 5, upon selection of virtual channel 21, an opening menu is provided. Figure 5 shows the opening menu 21 for the Real Estate channel, which provides categories for a user to choose from, in this instance different locations of homes for sale. In the example shown in Figure 5, the user chooses image number 300 from the opening menu 21, selecting to view homes for sale in the Plano area. Selection of image number 300 results in the receiver extracting and displaying image number 300 from the series of images in a continuous loop of images sent in the same field of the television channel (See Figure 3). In this instance, image number 300 is a sub-menu showing a further category, which in this instance is different price ranges of homes for sale. The user can then select which price range is desired and view homes in that category. In this example, the user has entered image number 331, which results in image 331 being extracted and displayed by the receiver. Image 331 in the Figure 5 example is the first image in the category relating to homes for sale starting at $200,000.00. The user can then sequentially view each image in this price range.

through the use of a "NEXT" function. The "NEXT" function will be discussed in more detail in connection with further embodiments of the invention provided below. The "NEXT" function allows the user to view the next image in a series of images. In this example, the images are numbered sequentially and image number 332 is displayed in response to the "NEXT" function, which is a second home for sale in the selected price range.

Figure 6 continues the above example and shows a representative view of the receiver extracting image number 332 from the series of images which make up virtual channel 21. When the user selects the "NEXT" function while viewing image number 331, the receiver begins looking for the next image after image 331 from the series of images sent in a continuous loop 400 in virtual channel 21, in this instance image 332. In Figure 6, the continuous loop of images 400 is shown containing a series of images 300 . . . 331, 332, 333, and 334.

Each image is tagged with data indicating an assigned virtual channel number, an image number and a "next image" number, as well as some additional control information. The next image number is to provide the receiver with information as to the presentation sequence for the images, as will be explained below. This image tagging data is embedded or encoded in the image, e.g., on the first line of active video, which in the case of NTSC and PAL-M is line 22. (This data could be carried in the VBI,

however this might not be as easily implemented in the authoring system.) This data is embedded or encoded into the image such that it is not easily perceptible to a viewer of the image. For example, such data can be innocuously inserted as black-white squares in a stripe at the top of a BMP or JPEG photo.

As indicated above, VC images are tagged, for example, on the first line of the active video with data indicating the virtual channel number, the image number and the next image number. Figure 7 shows two representative images 302 and 303. Image 302 is tagged with an image data tag 80 and image 303 is tagged with an image data tag 90. The data tag 80 of image 302 carries data fields 81, 82, and 83. Data field 81 can be thought of as the "category" of the image. In this implementation, it is the displayed channel number of the VC (the virtual channel number), VC21 in this instance, that the image belongs to. Data field 82 carries the image number of the image, in this instance image number 302. Data field 83 carries the image number which is the number of the next image in the series of images sent to the receiver, in this instance the next image number is 303. The data field 83 containing the next image number enables a user to extract and display the next image in succession through the use of a next function. In this case, use of the next function while viewing image number 302 would cause image number 303 to be captured and displayed. Image 303 carries a data tag 90 on its first line of active video which contains data fields

91, 92, and 93. Data field 91 carries the assigned virtual channel number, data field 92 carries the assigned image number for the image, and data field 93 carries a next image number identifying the next image in the series of images to be displayed.

If the user enters an image number that does not belong to the particular VC, then the receiver will not cause the image to be displayed. This allows multiple VCs to occupy a single channel without the possibility of images from one VC being displayed on another VC. It also allows VCs to be authored independently once the VC number is known, without having to coordinate image number ranges for each separate VC, i.e., image numbers do not have to be unique to a particular VC.

For example, Figure 8 shows two virtual channels VC21 and VC22 which are sent in the same field of a television signal (See Figure 3). In this example, virtual channel VC21 comprises a Real Estate channel made up of successive images made up of images with image numbers 301, 302, 303, 304, 305, 306 . . . 359. Virtual channel VC22 comprises a Dining Guide made up of successive images with image numbers 301, 305, 310, 315, 320, 325 . . . 380. As indicated, the image numbers used for the images in the two virtual channels, VC21 and VC22, are not unique (VC21 has an image number 301, 305, 310, etc and which are also present in VC22). However, since the images are tagged with the virtual channel number as well as the image number, the possibility of images from one VC being

displayed on another VC is eliminated. In the example shown in Figure 8, when a user is tuned to virtual channel VC21 (Real Estate) and selects image number 305, the user will be presented with image 305 of the real estate channel VC21 - e.g. an ad for real estate - rather than the image 305 from VC22 (Dining Guide) - e.g. a restaurant ad.

Tuning a VC is accomplished exactly as with any other channel. Once the channel number is entered, the receiver tunes to a physical channel via a channel map. The channel map extensions implemented for doubled channels (the doubled bit and the field selector bit) results in the receiver switching to channel doubled operation, if the channel is in fact doubled. Once tuned to the channel, the receiver begins reading VBI or other tagging data. In this tagging data there is a VC bit. If this bit is set, the receiver then knows to go into VC mode and capture the opening image. Once in VC mode, the receiver begins reading the image tagging data. The receiver is looking for an image tagged with a unique "opening image" identifier. In one particular implementation, 0,000 is used as the image number of the opening image, by definition, and the VC category identifier matches the displayed channel number of the tuned channel. This avoids having to download "displayed channel number" to "opening image number" links, although this is another method for accomplishing the same thing. For example, as shown in Figure 3 if the user tunes to channel number 21, and channel 21 is mapped to the odd

field of physical channel 1 and this is a VC, then the receiver is examining each successive odd field of channel 1, looking for an image with image number 000 and VC number 21. If the VC bit is not set, then this half of the doubled channel is a normal video/audio service. Since the VC number tag enforces segregation of images, it is possible to have duplicated image numbers between VCs with no ill effect.

As shown in Figure 3, it is possible to have multiple VCs carried on one half of a physical channel. Alternatively, in the general case, multiple VCs can be carried on a full physical channel. In the former situation, multiple displayed channel numbers are all mapped to the same physical half channel, i.e. odd field 3 of physical channel 1 of Figure 3. Each VC has its own opening image (typically a menu) identified by an image number that is equal to 000 and a VC number that is equal to the displayed channel number.

Building on the example from the previous paragraph, suppose channels 21, 22, and 23 all map to the odd field of channel 1 (Figure 3). The opening menu for channel 21 is an image tagged as image 000 and vc21, the opening menu for channel 22 is an image tagged as image 000 and vc22, etc. Further, suppose channel 21 is the Real Estate VC with all of its images numbered in the range 110 to 380 and channel 22 is the VC for a Dining Guide with all of its images numbered in the range of 400 to 900. The user can enter 21 and see the opening menu for the Real Estate

VC. This menu might have houses for sale in Carrollton starting at image 110, houses for sale in Lewisville starting at image 150, houses for sale in Plano starting at image 300, and houses for sale in Richardson starting at image 350, as shown in Figure 5. If the user enters IMAGE 300, the first image of houses for sale in Plano will appear, in this example a menu of price ranges. If the user enters 331, the first image 331 in the series of images relating to $200,000.00 houses for sale in Plano will appear. Pressing NEXT will advance to the next image of houses for sale, as identified by the next image number. Entering IMAGE 334 will cause the image with that image number to be displayed, if it exists in the parade of images. However entering IMAGE 456 will not cause the image with that image number to be displayed, even if it exists in the parade of images, because that image belongs to another VC (in this case, the Dining Guide vc22). The user must tune to channel 22 in order to get to image number 456, since it belongs to the Dinging Guide VC on channel 22 and thus will be tagged with this category number.

The user tunes to a virtual channel just like any other channel, e.g. by pressing FAV (favorite), CH UP (channel up), CH DN (channel down), by timer event, or by directly entering the channel number (one or more digits) via the user remote control. This allows for a channel number to be assigned, for example, to a Real Estate channel, and another channel number to be assigned to a Dining Guide, etc. The receiver

contains a channel map that maps displayed channel numbers to physical channel numbers. This map instructs the receiver which physical channel to tune for the user selected channel number.

Once the VC is tuned, the user sees a standard (e.g., blue) screen. On the standard screen, in the upper right hand corner, an indicia such as a blinking > appears from the standard receiver OSD subsystem. At all times an LED display on the receiver shows the channel number that the user selected to tune the channel. After typically a few seconds, the standard screen is replaced by a still video image and the indicia > is no longer displayed. This image, in most applications, will be an opening menu for example menu 21 of Figure 5. Each menu selection item will indicate a three-digit image number that the user must enter to select that menu item. A cursor based selection mechanism could be implemented by establishing some contraints dealing with how many selections are allowed on an image and where the selections are located. This would require additional image tagging data and cursor up/down controls.

In order to enter an image number, the user must first press, e.g., an "IMAGE" button. Pressing IMAGE switches the receiver to a mode where numeric buttons pressed are taken as input of image numbers instead of channel numbers. As the user enters the image number to go to the next image, the number is displayed on screen, in the upper right hand corner of the screen. As the digits are entered, the display progresses

from, for example, _ _ _ to 9_ _, *from 9 _ _* to 99_, and from 99_ to 999. If the user has entered one or more digits in error, pressing "IMAGE" will erase the display of image number, and causes the OSD to revert to _ _ _. The user can then re-enter the desired image number. It should be appreciated that other image entry means could be implemented, including scrolling entries from the right to the left, and the like. Similarly, the image number could be longer or shorter than three digits.

The operation described above is very consistent in that pressing the IMAGE button always precedes the entry of an image number. There is no time-out provision for numeric entry, although there could be. Image numbers 000 through 099 are reserved by convention for non-user entered image numbers. Should the user enter numbers in this range, leading zero(s) must be included. Again, this is an implementation detail and can be done differently.

In a preferred embodiment, all user-entered image numbers must be numbered greater than 99, but the system does not enforce this. If the user presses IMAGE when the OSD is displaying _ _ _, the three dashes are removed and the receiver will then take numeric entries as channel numbers instead of image numbers.

Once the image number is entered, an indicia such as a blinking > is displayed to the left of the number. This provides feedback to the user that the image number has been entered and that the receiver is

"looking for" the image. Until the specified image has been captured, the previously captured image remains displayed. Once the identified image has been captured, it is displayed by receiver and the blinking > together with the image number are removed from the OSD. If the identified image is not present in the system, it will obviously never be captured. There is no provision for the receiver to determine this; it will just sit there displaying the blinking >, the image number, and the previous image. Eventually, the user will run out of patience and will make a new entry to go to another image or channel. The fact that there is no provision to detect that an identified image is not present in the system is an implementation detail. A detection function could be provided, for example, by constraining all images to have image numbers in a contiguous range and then specifying the upper end of the range in the image tag data, or by other means.

Menus may be short enough to fit within a single image or may be long enough to require multiple images. Single image menus will typically have a next image identified that is simply the first image of the first menu selection or is an image of instructions. All but the last image of multiple image menus will have a next image identifier that points to the next image of the menu; the last image of the menu will typically have a next image identified just as single image menus do.

The opening image does not have to be a menu; it could be a single image or an image with a next image identified. The last image in a succession of images would most likely have a next image identified that is the opening menu. (The next image alternatives of the last image, i.e., a dead end, or of the first image in the sequence, i.e., a continuous loop, are not generally user friendly. However, the choice is up to the VC author.) When the NEXT button is pressed, the blinking > OSD (or other suitable indicia) is displayed. The next image number is not displayed. When the next image is retrieved, the blinking > is removed and the identified image is displayed.

As each successive image is retrieved, its image number is stored in a cache, allowing a "PREVIOUS" function. The cache is, for example, ten image numbers deep, allowing the user to back up 10 times, by pressing the "PREVIOUS" button. The image itself is not stored, and therefore retrieval of each previous image requires a reacquire of the appropriate image with its requisite time delay for the image to come around in the loop of images. However, if the user wishes to back up n images, pressing PREVIOUS n times will cause the reacquisition of the nth previous image, without having to reacquire the intermediate images. Again, this is merely an implementation detail.

PREVIOUS commands are not cached. Pressing PREVIOUS causes the blinking < OSD (or other suitable indicia) to be displayed. The previous image number

is not displayed. When the previous image is retrieved, the blinking < is removed and the identified image is displayed. Pressing PREVIOUS and then NEXT before the "previous" image is actually retrieved will return to the image presented prior to pressing PREVIOUS. That is, pressing NEXT cancels a PREVIOUS command and the blinking < OSD is removed. This is the same action as would be the case where the previous image was captured. In this case, pressing NEXT does not retrieve the next image number from the cache, but rather from the current image, as in all other cases. This is in contrast to Web browsers, which do use the cache for NEXT, since there is no explicit next image.

Image numbers are not displayed in response to NEXT and PREVIOUS; they are only displayed when entered by the user. If the VC author wants to have the image numbers displayed, then they can be included in the image in a location of the VC author's choice. Usually it is expected that the author will not want the image numbers displayed, since they are an artificial construct which has nothing to do with the content of the image and which can be changed at any time. Image numbers do not have to be assigned in sequential order. Indeed, over time during the operation of the system, it is likely that the image numbers will not be in order. Displaying the image numbers could therefore confuse the user. OSD display of the image numbers would also take away from the usable screen area. Thus, in a preferred embodiment

the image numbers are not displayed, however they could be.

Some applications will not have an opening menu, but rather will just have an opening image that is the first in a succession of images. An example of this type of application is an Electronic Program Guide (EPG). When the user tunes to the EPG VC, the first image presented might simply be the guide for the lowest channel numbers. Pressing NEXT would advance to the image of the next channel numbers, and so forth. This type of application is navigated by use of the NEXT and PREVIOUS buttons as described above, without the need to enter image numbers.

Alternatively, the EPG VC could have an opening menu, allowing selection of a time period. After selection of the time period, successive images would give the channel programming information for that time period. Within the images could be image numbers, allowing the user to select information about a particular program. The mechanism of the present invention is very flexible, without having to implement a lot of complexity in order to achieve this.

A "HOME" function can be provided which causes the channel's opening image to be captured and displayed and the receiver to accept numeric entry as channel numbers.

From the preceding discussion it can be seen that the following functions (or their equivalents) are needed to navigate in VCs: HOME, IMAGE, PREVIOUS, and NEXT. Dual use of the local buttons and/or dual use

of buttons on an existing remote control are not preferred as navigational controls for VCs due to the fact that such embodiments are not user friendly. Thus, a new enhanced remote control is preferred for navigation of virtual channels. Note however, that conventional remote controls will operate all receiver features other than VCs, giving a system operator that has no intention of using VCs two remote control unit choices.

In view of the above, it is proposed that a new remote control be provided that has dedicated VC navigation buttons for HOME, IMAGE, PREVIOUS, and NEXT (or the like). These buttons can be, e.g., at the bottom row on the remote control's keypad, in that order. In such an implementation, this set of new buttons does not involve dual use or non-intuitive buttons, and avoids the need to press Enter to get into VCs. It should be appreciated, of course, that the above discussion of remote controls relates to a specific implementation, and not the general case. Many other implementations can be designed while still using the present invention. In a preferred system, a video scrambler and VBI data inserter are provided for each channel that is to be controlled and/or scrambled. The unit that provides this function is called the HVP-IV. This unit optionally provides channel doubling as well as the aforementioned scrambling and data insertion. A VC's video stream must be sent through an HVP-IV in order to be given the appropriate VBI data and, optionally,

to be scrambled. If the second half channel is to be used for other services, its input video must be time aligned with the video for the VC(s) in the first half channel. The VBI data inserted by the HVP-IV is used to support channel authorization, scrambling, and other hardware control mechanisms unique to the receiver. In the general case, the required information could be included in the image tag data that is not in the VBI, or could be inserted in the VBI by a much less complex set of hardware.

Subjective testing of the VC concept has proved that some images look better if the interpolation processing of doubled channels is turned off. The VBI data contains a control bit that allows interpolation to be turned on or off. This can be used on VCs to turn off the interpolation. Note that all VCs contained in a physical half channel will all have interpolation turned either on or off, although this is merely an implementation detail. In one possible variation, the interpolation is allowed to be switched on or off on an image by image basis, based on control data embedded in the image.

VCs are authorized by the same authorization mechanism as any other physical channel, doubled or not. That is, via Free Access, Channel Package, downloaded PPV (pay-per-view) number, or IPPV (impulse PPV) purchase. Parental Access can be invoked as well. In the case of multiple VCs being sent on one physical half channel (i.e., the even or odd field), all such VCs are either all authorized or all not

authorized, since authorization is on the basis of the physical half channel. However Parental Access may be invoked on a VC by VC basis.

The assignment of image numbers and next image numbers is at the discretion of the VC author. It is not necessary that images that are to be viewed in succession be assigned sequential image numbers. It is necessary to correctly assign the next image number for the desired sequence. It is likely that most authors will in most cases chose to use sequential image numbers for convenience. Likewise, there is no requirement that images be sent in an order that is tied to image number. This is especially important in that the author may wish to send some images, e.g. menus, more often, to improve access time for those images.

Access time for a particular image is a function of how often the image is sent. This in turn is a function of the number of images in the overall loop, and how often the desired image is repeated in the loop. The average access time is simply the time between successive transmissions of a given image divided by two. For example, consider a VC loop of three hundred sixty images, each unique. In a channel doubled NTSC or PAL-M system, there are thirty images per second sent on the half channel from the headend. Therefore it takes twelve seconds to send them all. Best case access is immediate and worst case is twelve seconds for an average of six seconds. If it is desired to improve access to a given image, e.g., the

menu, that image can be repeated in the loop at even intervals. Continuing the previous example, if in the loop of three hundred sixty images the menu image appears three times, evenly spaced, then the menu appears every four seconds and the average access time for the menu is two seconds. The average access time for all other images remains six seconds. When the user first tunes a VC, a blank screen is displayed until the opening image is captured. Thus the importance of sending this image often.

The time interval at which the opening image is sent determines the VC acquisition time. Likewise, the time interval at which any menu is sent determines the menu acquisition time. While it is quite possible to author a VC with only knowledge of the nagivation mechanism (so that the author can correctly tag the images that are being added to the VC), the present invention allows the acquisition time to be tuned by the VC author, if desired. For example, if the VC author believes that most viewers will press the NEXT button after viewing a given image for ten seconds, then the image identified as the next image can be sent eleven seconds later, giving most viewers very quick access.

Another feature of the VC system is that of sequential image display capability, which includes some animation display capability. In the line 22 image tagging data is a bit indicating whether or not animation is allowed for the image. If animation is allowed, the receiver continually evaluates each image

as it is received to determine if it is tagged with the selected image number. If there is a matching image number, the receiver captures and displays the image. As a result, by sending different images with the same image number, each image will replace the preceding one automatically. The result of this is a function of how often the like-numbered images are sent and their content, and will vary from providing the effect of a slide show with fixed intervals to motion-JPEG.

Again, the VC author can tune the update rate by choosing the placement of images in the series of images. If animation is not allowed, then the image display will not be updated, but rather will only display the first capture of the selected image number, regardless of other images that may be sent with the same image number. One application of this capability might be the Photo VC, featuring a slide show of images of award winning photographs. The dwell time for each image would be determined by the placement of the images in the series of images by the VC author. The dwell time could be different for each image, if so desired. The same capability could be used to support, for example, a weather radar VC where images within the series of images would be periodically updated from a weather radar. The user tuned to the weather radar VC would automatically see the updated images as they are received.

Another application would be displaying a self-updating Web page from the Internet. As the page

updated, the new image would be sent in the VC system and grabbed and displayed by the receiver. Alternatively, the Web pages would not have to be self-updating. In this case, the VC author would export Web pages into the series of images in the receiver VC system. With the appropriate tagging information, the end-user could navigate through the pages to access the information contained therein.

It is noted that a VC can be used as a barker channel, as this is just another channel tuning method in the receiver. A barker channel provides a special video and/or audio output when the channel tuned to is not available to that user. Thus, when a channel that is not authorized is selected by the user, the receiver will tune to the barker channel if one is defined. If that barker channel happens to be a VC, then the VC will be tuned and the opening image will be presented. The content of the VC is determined by what the author wants to do. Just as with any VC, it can be one image that does not change, a menu with selections to access other images, or a slide show of a sequence of images, etc.

VCs can be scrambled just as any doubled channel can be. That is, they can be line-shuffled and/or the video can be inverted in a conventional manner. Note that all VCs sharing the same physical half channel will use the same scrambling method.

Although the invention has been described in connection with a preferred embodiment, it should be

appreciated that numerous adaptations and modifications may be made thereto without departing from the scope of the invention as set forth in the claims. For example, follow-on variants for PAL-N and for NTSC as well as other television systems are possible.

What is claimed is:

1. A method for providing information in the form of video still images to television viewers on an interactive request basis, comprising the steps of:

communicating said images to a receiver via virtual channels in an analog television channel signal;

selectively extracting images from said television channel signal at the receiver in response to user virtual channel requests;

storing the extracted images at said receiver; and

displaying the stored images on a television screen;

wherein images are selectable for display without communication from the user back to a television system operator.

2. A method in accordance with claim 1, wherein one of a series of images is extracted and displayed in response to a user request based on a previously extracted image.

3. A method in accordance with claim 1, wherein said receiver extracts an image based on at least one identifier embedded in the image.

4. A method in accordance with claim 3, wherein said at least one identifier comprises data innocuously encoded into a portion of said image.

5. A method in accordance with claim 1, wherein each virtual channel comprises a sequence of images provided in succession.

6. A method in accordance with claim 5, wherein said sequence is identified by a data tag associated with each of said images, including at least one of an image number or a next image number.

7. A method in accordance with claim 6, wherein the data tag further includes at least one of a virtual channel number or a category number.

8. A method in accordance with claim 5, wherein said sequence is identified by data tags embedded in each of said images.

9. A method in accordance with claim 8, wherein said data tags comprise data innocuously encoded into portions of said images.

10. A method in accordance with claim 5, wherein a first image displayed upon selecting a virtual channel is an opening menu channel, from which a user can choose a category and can enter an image number to retrieve a desired image from that category.

11. A method in accordance with claim 5, wherein the first image displayed upon selecting a virtual channel is an opening image in a succession of related images.

12. A method in accordance with claim 11, wherein the images comprise an electronic programming guide.

13. A method in accordance with claim 5, wherein the sequence of images provides one of an animation or slide show.

14. A method in accordance with claim 5, wherein:

successive but different images with identical image numbers are sent to the receiver, and

the images with the identical image numbers are displayed successively in order to provide a sequential image display.

15. A method in accordance with claim 1, wherein a plurality of virtual channels is carried in said analog television signal, the images of each virtual channel being identified by one of a category number or a virtual channel number unique to the respective virtual channel.

16. A method in accordance with claim 1, wherein:

said user virtual channel requests are made using a channel selector native to the user's receiver; and

virtual channels selected by a user via said channel selector are mapped to physical channels using a channel map provided in said receiver.

17. Apparatus for providing information in the form of video still images to television viewers on an interactive request basis, comprising:

a receiver for receiving and storing images communicated via virtual channels in an analog television channel signal;

wherein a user can selectively extract images from said television channel signal at the receiver in response to user virtual channel requests and display the stored images on a television screen, without communication from the user back to a television system operator.

18. Apparatus in accordance with claim 17, wherein one of a series of images is extracted and displayed in response to a user request based on a previously extracted image.

19. Apparatus in accordance with claim 18, wherein said receiver extracts an image based on at least one identifier embedded in the image.

20. Apparatus in accordance with claim 19, wherein said at least one identifier comprises data innocuously encoded into a portion of said image.

21. Apparatus in accordance with claim 17, wherein each virtual channel comprises a sequence of images provided in succession.

22. Apparatus in accordance with claim 21, wherein said sequence is identified by a data tag associated with each of said images, including at least one of an image number or a next image number.

23. Apparatus in accordance with claim 22, wherein the data tag further includes at least one of a virtual channel number or a category number.

24. Apparatus in accordance with claim 21, wherein said sequence is identified by data tags embedded in each of said images.

25. Apparatus in accordance with claim 24, wherein said data tags comprise data innocuously encoded into portions of said images.

26. Apparatus in accordance with claim 21, wherein a first image displayed upon selecting a virtual channel is an opening menu channel, from which a user can choose a category and can enter an image number to retrieve a desired image from that category.

27. Apparatus in accordance with claim 21, wherein the first image displayed upon selecting a virtual channel is an opening image in a succession of related images.

28. Apparatus in accordance with claim 27, wherein the images comprise an electronic programming guide.

29. Apparatus in accordance with claim 21, wherein the sequence of images provides one of an animation or slide show.

30. Apparatus in accordance with claim 21, wherein the receiver receives successive but different images with identical image numbers, and

the receiver displays images with the identical image numbers successively in order to provide a sequential image display.

31. Apparatus in accordance with claim 17, wherein a plurality of virtual channels is carried in said analog television signal, the images of each virtual channel being identified by one of a category number or a virtual channel number unique to the respective virtual channel.

32. Apparatus in accordance with claim 17, wherein:

said user virtual channel requests are made using a channel selection device native to the user's receiver; and

virtual channels selected by a user via said channel selection device are mapped to physical channels using a channel map provided in said receiver.

33. Apparatus in accordance with claim 32, wherein the channel selection device comprises at least one of a local control or a remote control, said control including:

a first function to cause a virtual channel's opening image to be captured and displayed;

a second function to cause the receiver to recognize numeric entries as image numbers;

a third function to access a cache of stored image numbers corresponding to previously viewed images and to reacquire the previously viewed images; and

a fourth function to cause the next image in a series of images to be displayed.

34. Apparatus in accordance with claim 33, wherein each of said control functions is actuated using at least one corresponding function button on said channel selection device.

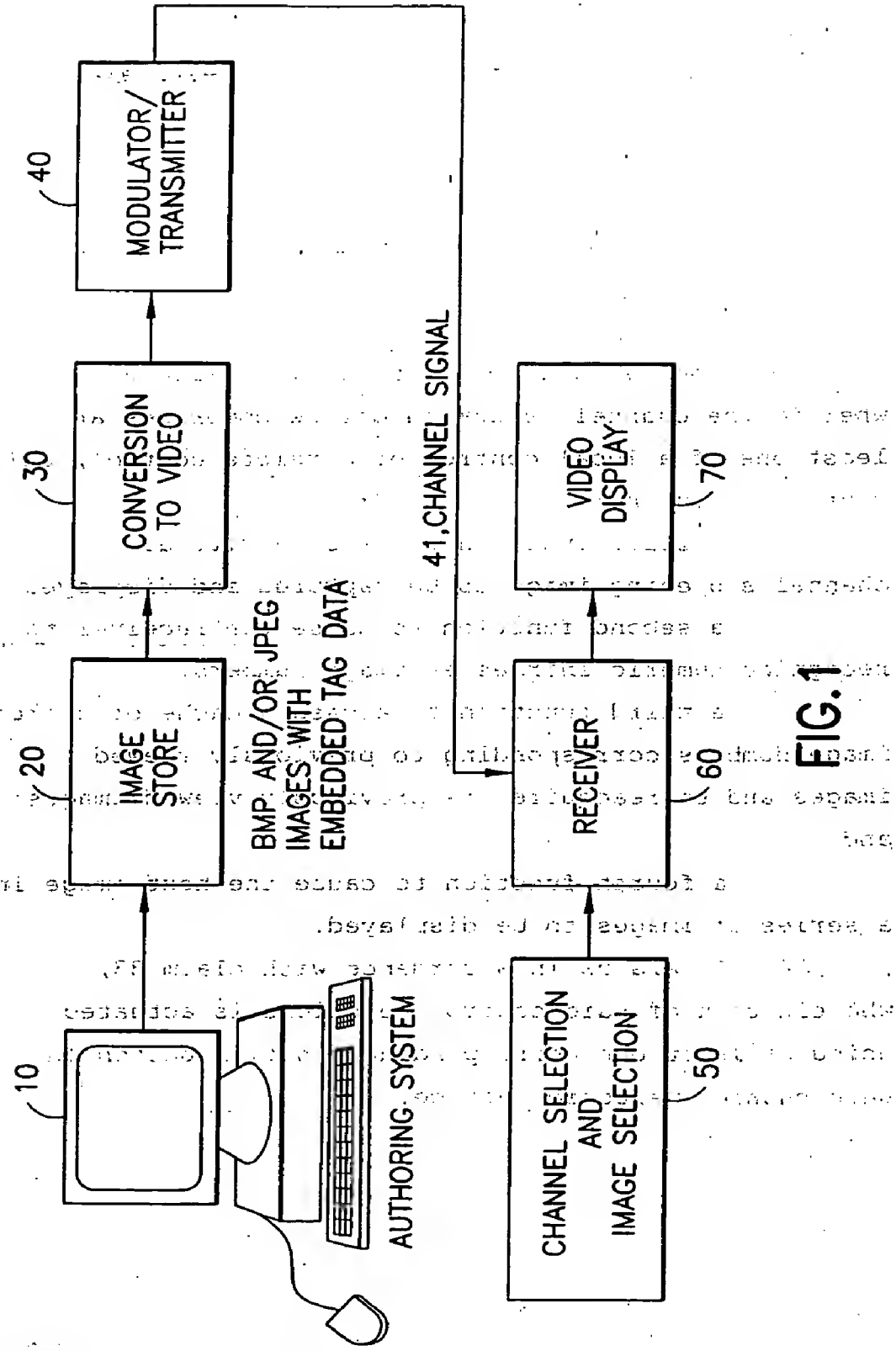
MODULATOR/ TRANSMITTER
40
CONVERSION TO VIDEO
30
IMAGE STORE
20
BMP AND/OR JPEG IMAGES WITH EMBEDDED TAG DATA
41,CHANNEL SIGNAL
VIDEO DISPLAY
70
RECEIVER
60
AUTHORING SYSTEM
10
CHANNEL SELECTION AND IMAGE SELECTION
50

FIG. 1

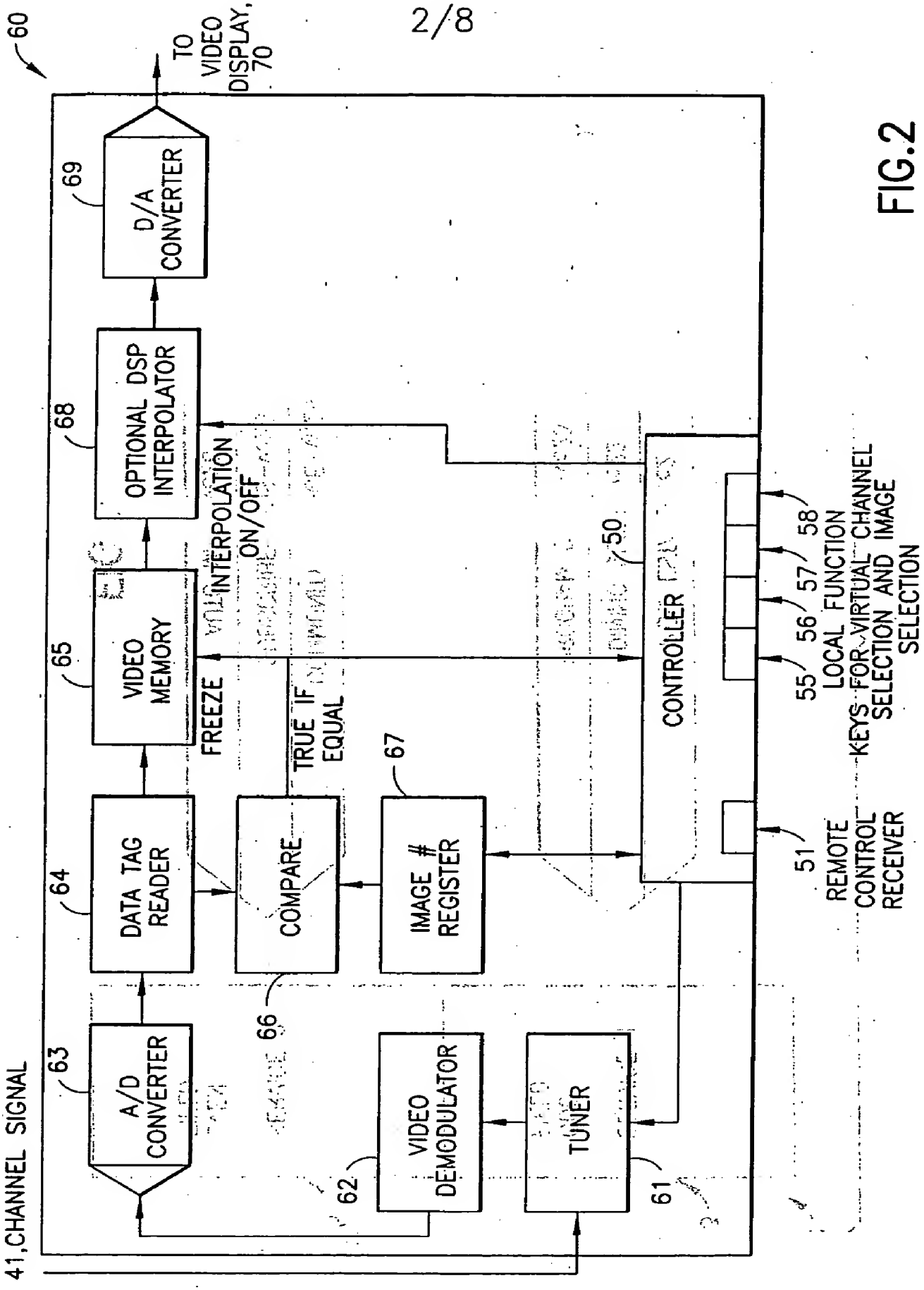
60
TO VIDEO DISPLAY, 70
69
D/A CONVERTER
68
OPTIONAL DSP INTERPOLATOR
INTERPOLATION ON/OFF
65
VIDEO MEMORY
FREEZE
TRUE IF EQUAL
67
64
DATA TAG READER
COMPARE
IMAGE # REGISTER
CONTROLLER
50
55
56
57
58
LOCAL FUNCTION KEYS FOR VIRTUAL CHANNEL SELECTION AND IMAGE SELECTION
51
REMOTE CONTROL RECEIVER
63
A/D CONVERTER
66
62
VIDEO DEMODULATOR
61
TUNER
41,CHANNEL SIGNAL

FIG.2

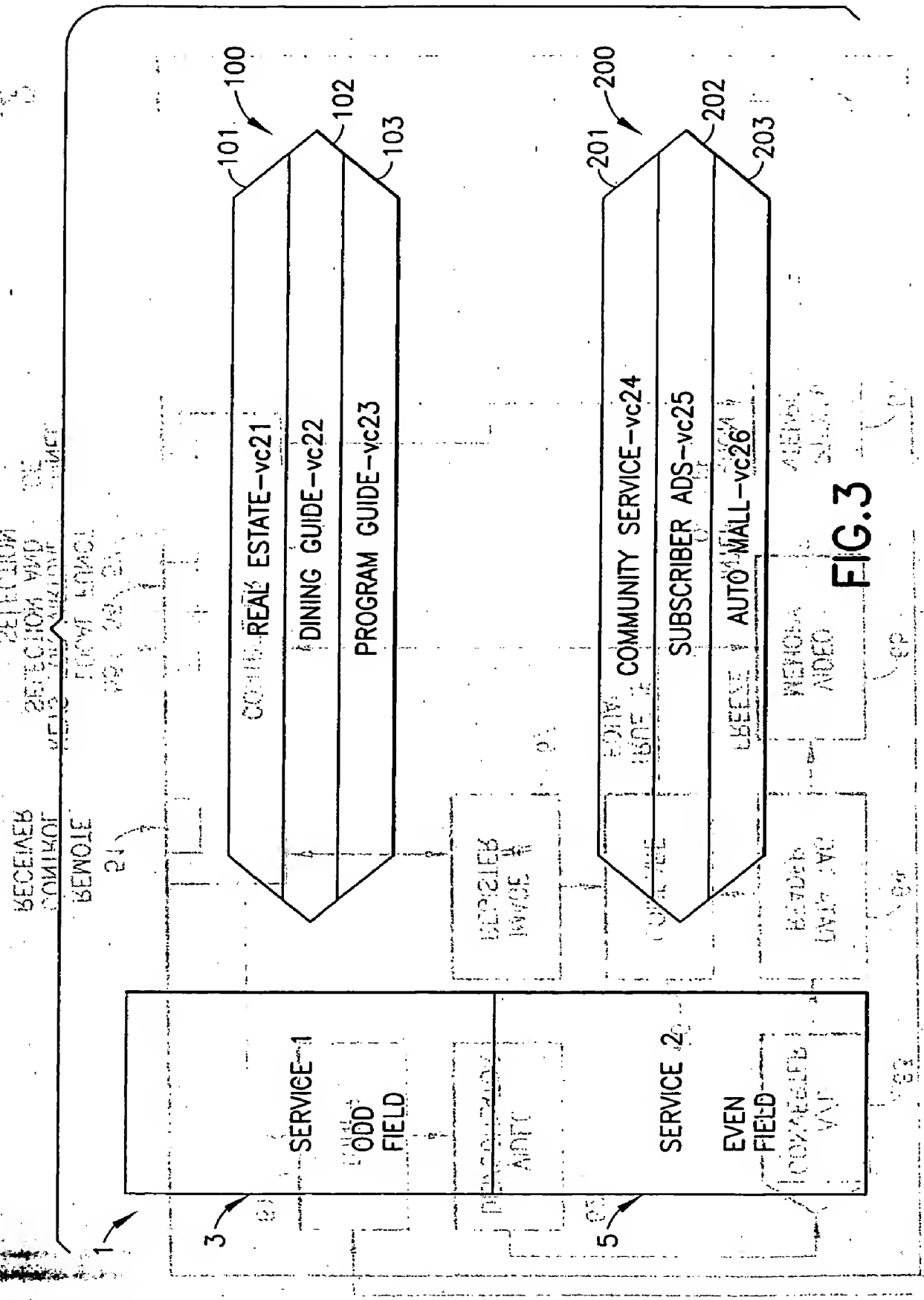

FIG.3

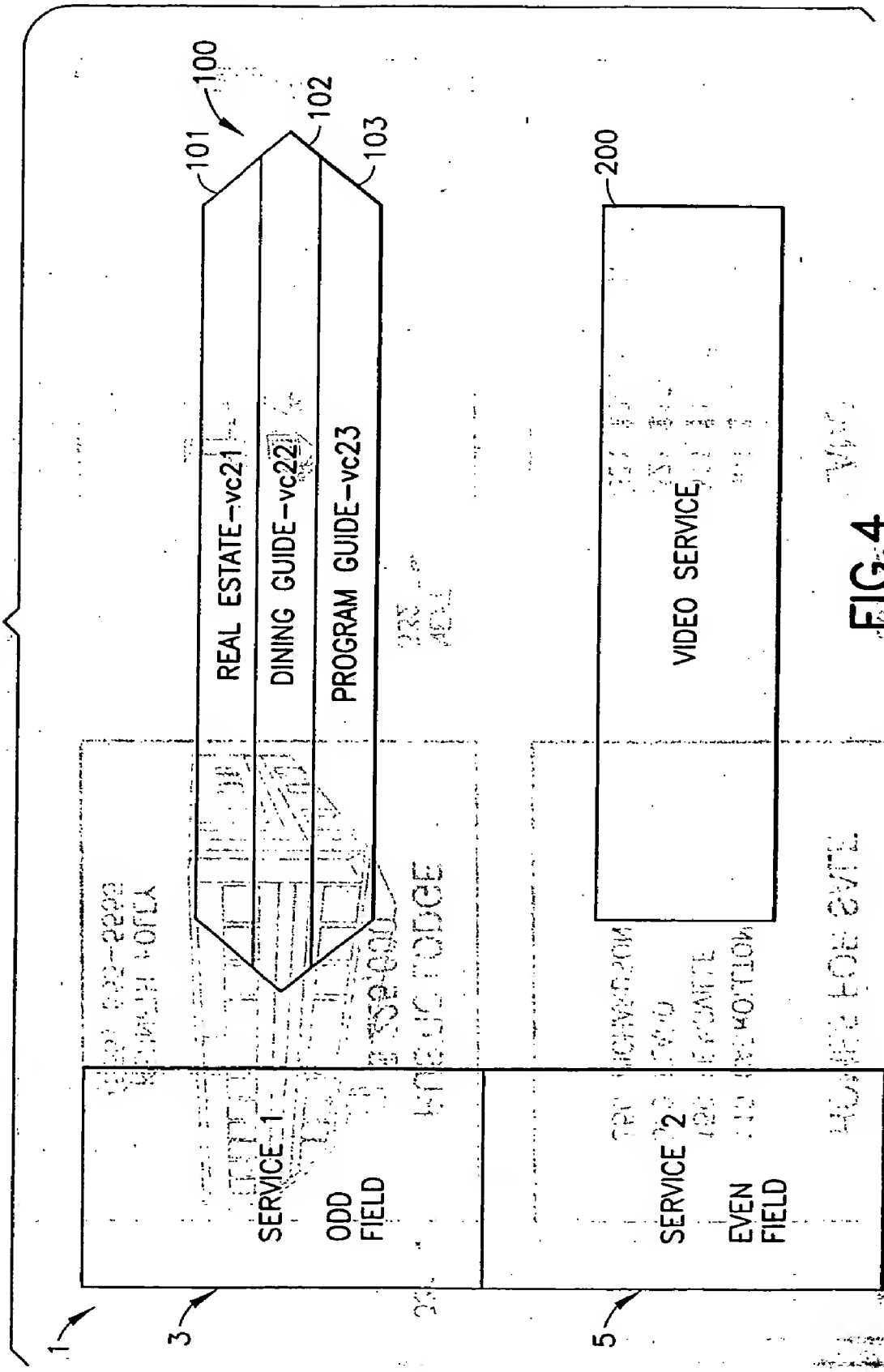
100
101
102
103
200
REAL ESTATE–vc21
DINING GUIDE–vc22
PROGRAM GUIDE–vc23
VIDEO SERVICE
SERVICE 1
ODD FIELD
SERVICE 2
EVEN FIELD
1
3
5

FIG.4

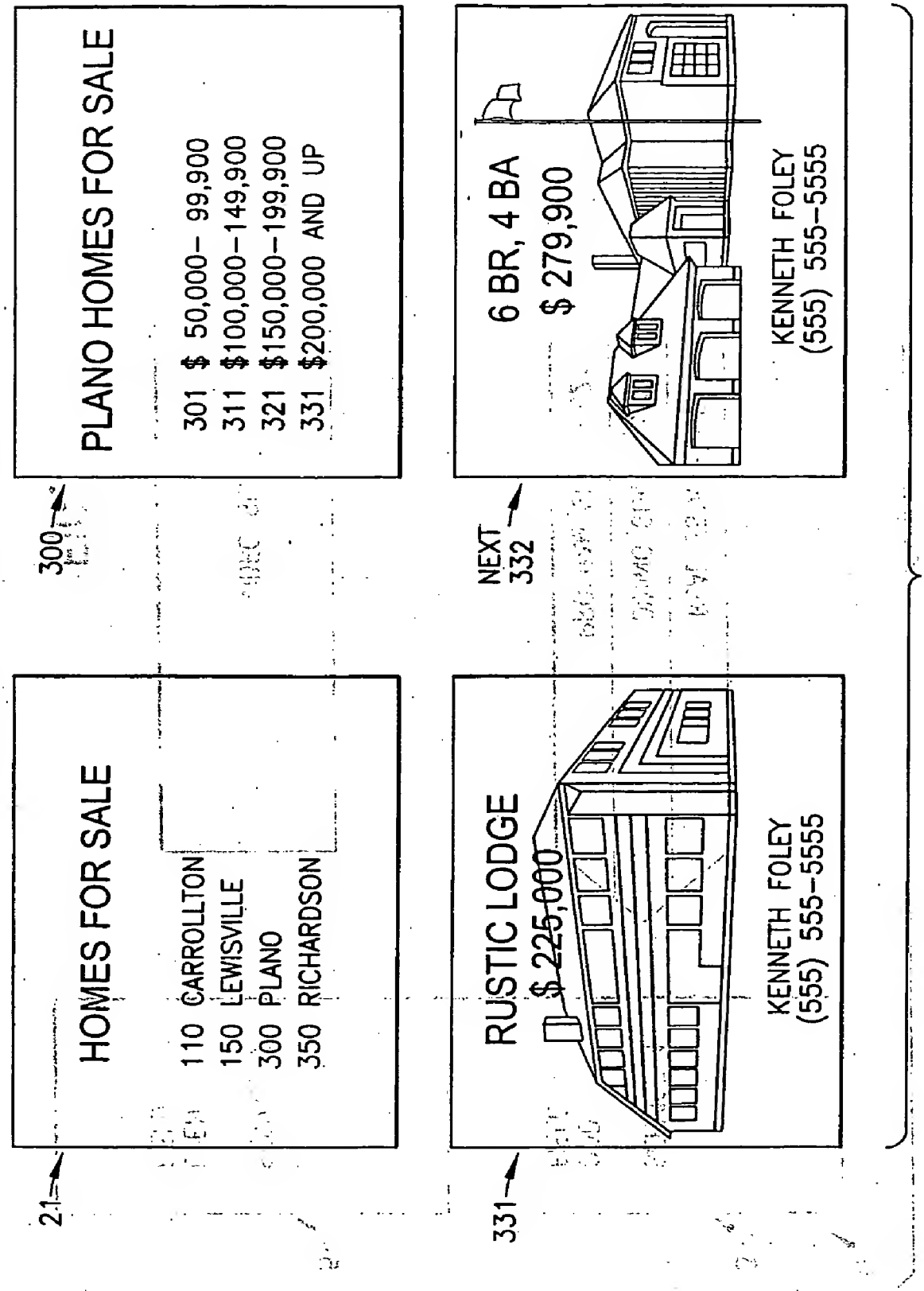

FIG.5

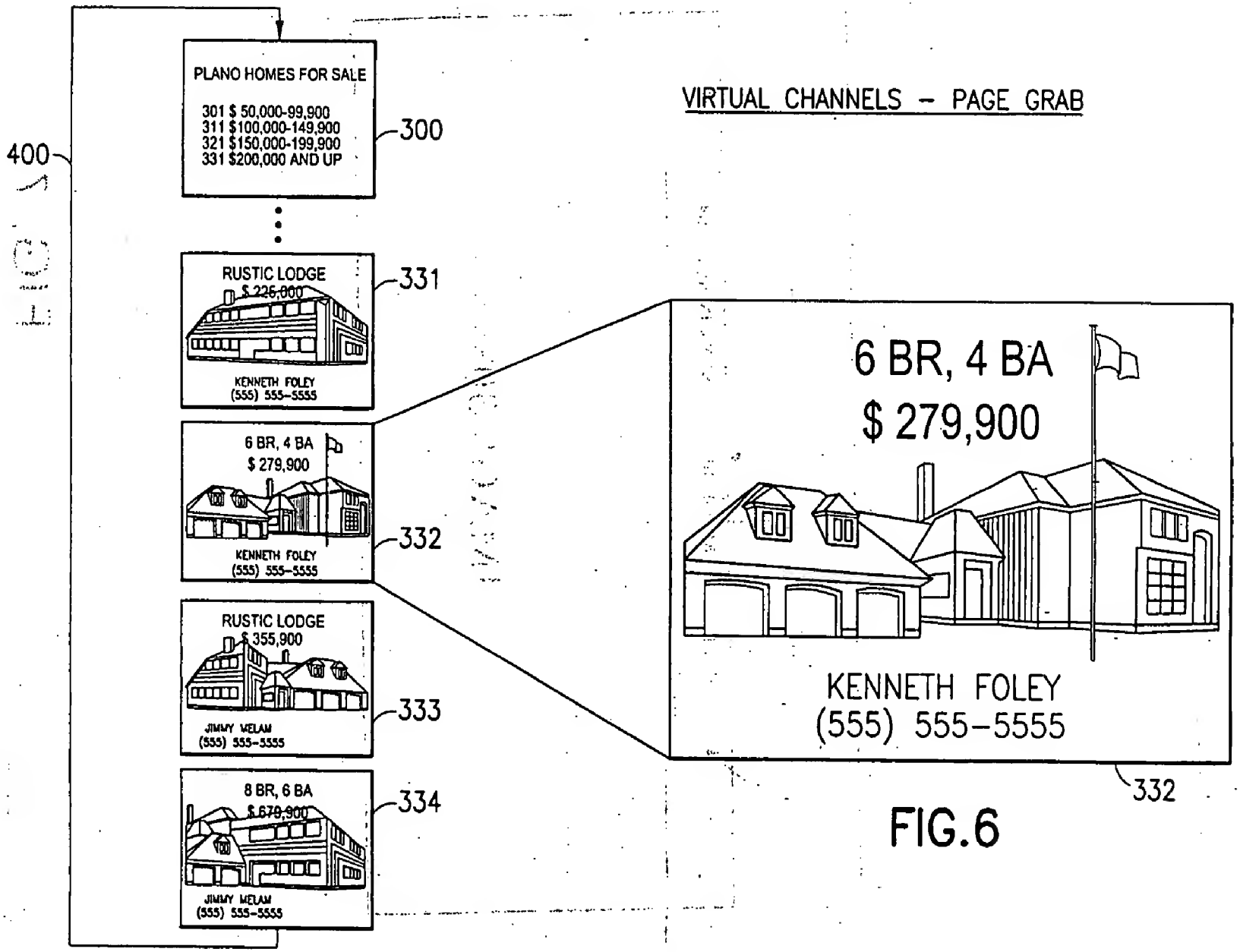
VIRTUAL CHANNELS – PAGE GRAB
400
PLANO HOMES FOR SALE
301 $ 50,000-99,900
311 $100,000-149,900
321 $150,000-199,900
331 $200,000 AND UP
300
RUSTIC LODGE
$ 226,000
KENNETH FOLEY
(555) 555-5555
331
6 BR, 4 BA
$ 279,900
KENNETH FOLEY
(555) 555-5555
332
RUSTIC LODGE
$ 355,900
JIMMY MELAM
(555) 555-5555
333
8 BR, 6 BA
$ 679,900
JIMMY MELAM
(555) 555-5555
334
6 BR, 4 BA
$ 279,900
KENNETH FOLEY
(555) 555-5555
332

FIG.6

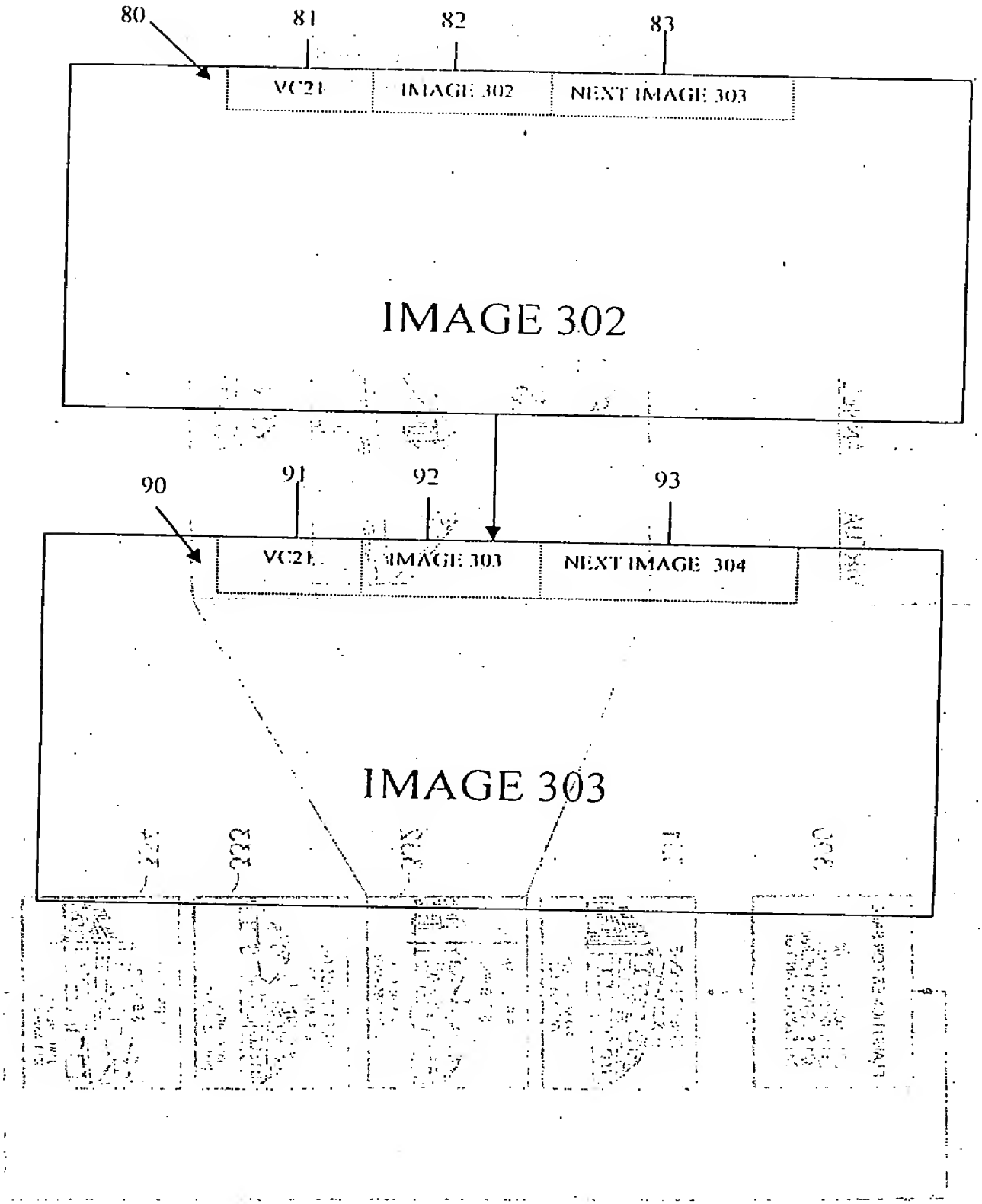
80
81
82
83
VC21
IMAGE 302
NEXT IMAGE 303
IMAGE 302
90
91
92
93
VC21
IMAGE 303
NEXT IMAGE 304
IMAGE 303

FIG. 7

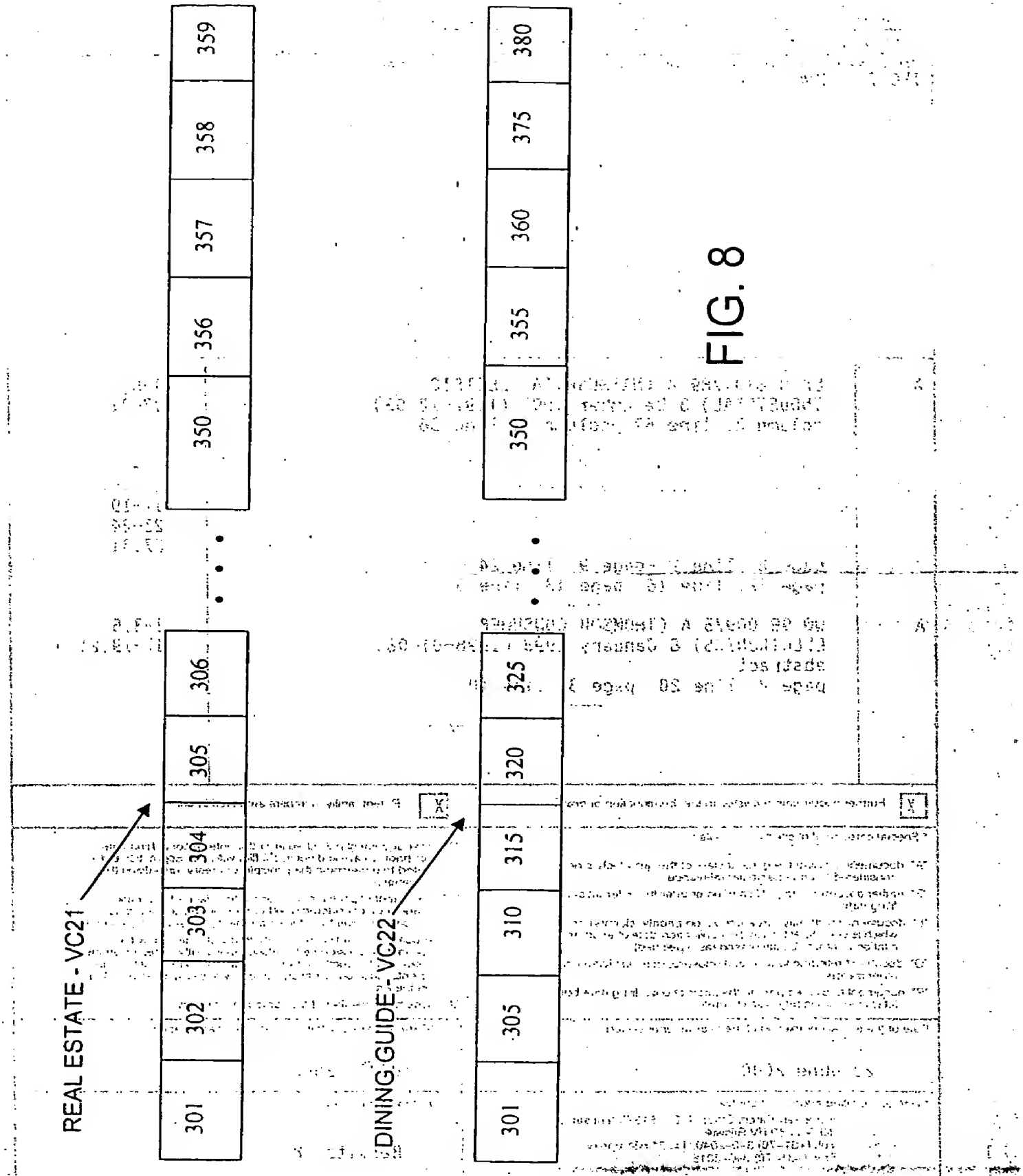
REAL ESTATE - VC21
301
302
303
304
305
306
350
356
357
358
359
GUIDING GUIDE - VC22
301
305
310
315
320
325
350
355
360
375
380

FIG. 8

INTERNATIONAL SEARCH REPORT

Int. Ional Application No
PCT/US 00/07747

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N7/088

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 810 789 A (MATSUSHITA ELECTRIC INDUSTRIAL) 3 December 1997 (1997-12-03) column 2, line 57 -column 4, line 56	1-5, 17-21
A	WO 95 34170 A (FUTUREVISION OF AMERICA) 14 December 1995 (1995-12-14) page 8, line 2 -page 9, line 24 page 12, line 16 -page 13, line 3	1-3,5-8, 11,15, 17-19, 21-24, 27,31
A	WO 98 00975 A (THOMSON CONSUMER ELECTRONICS) 8 January 1998 (1998-01-08) abstract page 2, line 20 -page 3, line 10	1-3,5, 17-19,21

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 June 2000	04/07/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Berwitz, P

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Int. ional Application No
PCT/US 00/07747

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 830 027 A (NAKANO) 18 March 1998 (1998-03-18) abstract column 1, line 5 - line 10 column 7, line 25 - line 32 column 9, line 5 - line 10	1,2,5, 10,17, 18,21,26
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INTERNATIONAL SEARCH REPORT

information on patent family members

Intl Jonal Application No
PCT/US 00/07747

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		AT 175539 T	15-01-1999
		AU 643926 B	25-11-1993
		AU 1383992 A	05-11-1992
		DE 69228085 D	18-02-1999
		DE 69228085 T	26-08-1999